Preliminary Amendment dated October 26, 2005

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1-20. (Cancelled)

21. (Previously Presented) A process for the production of alkenes from alkanes, comprising:

(A) feeding a first zone feed to a first reaction zone having a combustion catalyst, wherein the first zone feed comprises an oxygen-containing gas and a fuel;

(B) contacting the first zone feed with the combustion catalyst under conditions sufficient to combust at least a portion of the fuel so as to form a first reaction zone effluent having less than about 1,000 ppm oxygen;

(C) feeding the first reaction zone effluent to a second reaction zone;

(D) introducing an oxygen-containing feed and an alkane feed to the second reaction zone; and

(E) reacting at least a portion of the alkane feed with oxygen in the second reaction zone at conditions sufficient to form an alkene product.

22. (Original) The process of claim 21, wherein the fuel comprises hydrogen, carbon monoxide, C1-C4 alkanes, C1-C4 alkenes, naphtha, natural gas, syngas, or mixtures thereof.

23. (Original) The process of claim 22, wherein the first zone feed has a molar O_2:C ratio less than 2:1.

24. (Original) The process of claim 21, wherein the fuel comprises carbon monoxide.

25. (Original) The process of claim 24, wherein the first zone feed has a molar O_2:C ratio less than 1:2.

26. (Original) The process of claim 21, wherein step (A) further comprises preheating the first zone feed prior to feeding the first zone feed to the first reaction zone.

27. (Original) The process of claim 21, wherein the conditions sufficient of step (B) include temperatures of from about 200° C to about 1,000° C.

28. (Original) The process of claim 21, wherein the combustion catalyst comprises platinum, palladium, rhodium, ruthenium, iridium, osmium, chromium, or combinations thereof.

29. (Original) The process of claim 21, wherein the combustion catalyst comprises platinum, palladium, chromium, or combinations thereof.

30. (Original) The process of claim 21, wherein the first reaction zone comprises a diluted catalytic bed comprising the combustion catalyst and a diluent material.

31. (Original) The process of claim 30, wherein the diluent material comprises a refractory oxide.

32. (Previously Presented) The process of claim 21, wherein the first reaction zone effluent comprises less than 100 ppm oxygen.

33. (Previously Presented) The process of claim 21, wherein the second reaction zone comprises an inorganic oxide.

34. (Original) The process of claim 21, wherein the second reaction zone excludes a catalyst.

35. (Original) The process of claim 21, wherein the second reaction zone includes a catalyst comprising a metal from the group consisting of Groups 2, 4-7, 11-15 metals of the Periodic Table of the Elements, scandium, yttrium, actnium, iron, cobalt, nickel, oxides of any such metals, and combinations thereof.

36. (Original) The process of claim 21, wherein the alkane feed and the oxygen-containing feed are mixed prior to being introduced in step (D) to the second reaction zone.

37. (Original) The process of claim 21, wherein the alkane feed comprises ethane.

38. (Original) The process of claim 21, wherein the alkane feed further comprises oxygen.

39. (Previously Presented) The process of claim 38, wherein the alkane feed comprises an alkane to oxygen molar ratio of from about 1.6:1 to about 10:1.

40. (Original) The process of claim 21, wherein the conditions sufficient of step (E) include temperatures from about 600° C to about 1,200° C.

41. (Original) The process of claim 21, wherein the process comprises an alkane conversion of at least about 60 percent, and an alkene selectivity of at least about 50 percent.

42. (Original) The process of claim 21, wherein the second reaction zone comprises a heating zone in thermal contact with the first reaction zone, and wherein step (D) further comprises heating the alkane feed through the heating zone by heat transfer from the first reaction zone to the heating zone.

43. (Original) The process of claim 42, wherein the alkane feed and the oxygen-containing feed are introduced separately, and the oxygen-containing feed is introduced to the second reaction zone without passing through the heating zone.

44. (Previously Presented) A process for the production of alkenes from alkanes, comprising:

(A) feeding a first zone feed to a first reaction zone having a combustion catalyst, wherein the first zone feed comprises an oxygen-containing gas and a fuel;

(B) contacting the first zone feed with the combustion catalyst under conditions sufficient to combust at least a portion of the fuel so as to produce heat and a combustion zone effluent;

(C) feeding an alkane feed to a second reaction zone comprising a heating zone, wherein the heating zone is in thermal contact with the first reaction zone through a dividing element that allows at least a fraction of the heat produced in the first reaction zone to be transferred to the heating zone, and wherein the dividing element does not allow permeation of gaseous components to and from the heating zone and the first reaction zone, and further wherein the alkane feed passes through the heating zone and absorbs a sufficient amount of the heat produced in the first reaction zone to initiate the conversion of at least one alkane to an alkene in the second reaction zone; and

(D) converting at least a portion of the alkane feed so as to form an alkene product.

45. (Original) The process of claim 44, wherein the fuel comprises hydrogen, carbon monoxide, C1-C4 alkanes, C1-C4 alkenes, naphtha, natural gas, syngas, or mixtures thereof.

46. (Original) The process of claim 44, wherein the alkane feed comprises ethane, and wherein the alkene product comprises ethylene.

47. (Original) The process of claim 44, wherein the alkane feed further comprises an oxygen-containing gas.

48. (Previously Presented) The process of claim 47, wherein the alkane feed comprises an alkane to oxygen molar ratio of from about 1.6:1 to about 10:1.

49. (Previously Presented) A process for the production of alkenes from alkanes, comprising:

(A) feeding a first zone feed to a first reaction zone having a combustion catalyst, wherein the first zone feed comprises an oxygen-containing gas and a fuel;

(B) contacting the first zone feed with the combustion catalyst under conditions sufficient to combust at least a portion of the fuel so as to form a first reaction zone effluent;

(C) providing an alkene production zone comprising a heating zone in thermal contact with the first reaction zone through a dividing element that allows at least a fraction of the heat produced in the first reaction zone to be transferred to the heating zone, and wherein the dividing element does not allow permeation of gaseous components to and from the heating zone and the first reaction zone, and further wherein the alkene production zone excludes a catalyst;

(D) passing the first reaction zone effluent to the alkene production zone;

(E) introducing an alkane feed to the alkene production zone;

(F) heating the alkane feed through the heating zone of the alkene production zone by heat transfer from the first reaction zone to the heating zone; and

(G) reacting at least a portion of the alkane feed with oxygen in the alkene production zone at conditions sufficient to form an alkene product.

50. (Original) The process of claim 49, wherein the fuel comprises hydrogen, carbon monoxide, C1-C4 alkanes, C1-C4 alkenes, naphtha, natural gas, syngas, or mixtures thereof.

51. (Original) The process of claim 50, wherein the first zone feed has a molar O_2:C ratio less than 2:1.

52. (Original) The process of claim 49, wherein the fuel comprises carbon monoxide.

53. (Original) The process of claim 52, wherein the first zone feed has a molar O_2:C ratio less than 1:2.

54. (Original) The process of claim 49, wherein step (A) further comprises preheating the first zone feed prior to feeding the first zone feed to the first reaction zone.

55. (Original) The process of claim 49, wherein the conditions sufficient of step (B) include temperatures of from about 200° C to about 1,000° C.

56. (Original) The process of claim 49, wherein the combustion catalyst comprises platinum, palladium, chromium, or combinations thereof.

57. (Original) The process of claim 49, wherein the first reaction zone comprises a diluted catalytic bed comprising the combustion catalyst and a diluent material.

58. (Original) The process of claim 57, wherein the diluent material comprises a refractory oxide.

59. (Original) The process of claim 57, wherein the diluted catalytic bed comprises a diluent material-to-catalyst weight ratio between about 1:2 and about 10:1.

60. (Original) The process of claim 49, wherein the alkene production zone comprises an inorganic oxide.

61. (Original) The process of claim 49, wherein the alkane feed comprises ethane, and the alkene product comprises ethylene.

62. (Original) The process of claim 49, wherein the alkane feed further comprises oxygen.

63. (Previously Presented) The process of claim 62, wherein the alkane feed comprises an alkane to oxygen molar ratio of from about 1.6:1 to about 10:1.

64. (Original) The process of claim 49, wherein the conditions sufficient of step (G) include temperatures from about 600° C to about 1,200° C.

65. (Original) The process of claim 49, wherein the process comprises an alkane conversion of at least about 60 percent, and an alkene selectivity of at least about 50 percent.

66. (Original) The process of claim 49, further comprising introducing a supplemental oxygen feed to the alkene production zone without passing it through the heating zone.

67. (Previously Presented) The process of claim 49, wherein the first reaction zone effluent contains at least 1000 ppm oxygen.

68. (Previously Presented) The process of claim 44, wherein the second reaction zone includes a catalyst.

69. (Previously Presented) The process of claim 44, wherein the combustion zone effluent comprises less than about 1,000 ppm oxygen.

70. (Previously Presented) The process of claim 69, wherein the alkane feed further comprises an oxygen-containing gas.

71. (Previously Presented) The process of claim 44, wherein the alkane feed flows through the heating zone in the same direction as the gaseous components in the first reaction zone.

72. (Previously Presented) The process of claim 44, wherein the alkane feed is fed at ambient temperature to the second reaction zone.

73. (Previously Presented) The process of claim 44, wherein the alkene product exits the heating zone of the second reaction zone and mixes with the combustion zone effluent to form a mixed product stream.

74. (Previously Presented) The process of claim 73, wherein the mixed product stream is fed to an alkene production catalyst bed.

75. (Previously Presented) The process of claim 74, wherein a supplemental oxygen stream is further fed to the alkene production catalyst bed.

76. (Previously Presented) A process for the production of alkenes from alkanes, comprising:

(A) feeding a first zone feed to a first reaction zone having a syngas catalyst, wherein the first zone feed comprises an oxygen-containing gas and a fuel;

(B) contacting the first zone feed with the syngas catalyst under conditions sufficient to react at least a portion of the fuel with oxygen so as to produce heat and a first zone effluent comprising carbon monoxide, optionally carbon dioxide, and hydrogen;

(C) feeding an alkane feed to a second reaction zone comprising a heating zone, wherein the heating zone is in thermal contact with the first reaction zone through a dividing element that allows at least a fraction of the heat produced in the first reaction zone to be transferred to the heating zone, and wherein the dividing element does not allow permeation of gaseous components to and from the heating zone and said first reaction zone, and wherein the alkane feed passes through the heating zone and absorbs a sufficient amount of the heat produced in the first reaction zone to initiate the conversion of at least one alkane to an alkene in the second reaction zone; and

(D) converting at least a portion of the alkane feed so as to form an alkene product.

77. (Previously Presented) The process of claim 76, further comprising feeding the first zone effluent to the second reaction zone.

78. (Previously Presented) The process of claim 76, wherein the first zone effluent comprises at least about 1,000 ppm oxygen.

79. (Previously Presented) The process of claim 76, wherein the first zone effluent comprises less than about 1,000 ppm oxygen.

80. (Previously Presented) The process of claim 76, wherein the alkane feed further comprises oxygen.

81. (Previously Presented) The process of claim 80, wherein the alkane feed comprises an alkane to oxygen molar ratio of from about 1.6:1 to about 10:1.

82. (Previously Presented) The process of claim 76, wherein the alkene product exits the heating zone of the second reaction zone and mixes with the first zone effluent to form a mixed product stream.

83. (Previously Presented) The process of claim 82, wherein the mixed product stream is fed to an alkene production catalyst bed.

84. (Previously Presented) The process of claim 83, wherein a supplemental oxygen stream is further fed to the alkene production catalyst bed.

85. (Previously Presented) The process of claim 76, wherein the fuel comprises hydrogen, carbon monoxide, C1-C4 alkanes, C1-C4 alkenes, naphtha, natural gas, syngas, or mixtures thereof.

86. (Previously Presented) The process of claim 44, wherein the alkane feed further comprises steam.

87. (New) The process of claim 44, wherein the dividing element has the shape of a tube with a first surface area in contact with the first reaction zone and a second surface area in contact with

the heating zone such that the first surface area and the second surface area are on opposite sides of the dividing element.